

GEOLOGY OF MORGAN COUNTY.

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GEOGRAPHICAL AND HISTORICAL NOTES.

Morgan county covers an area of 409 square miles, lying in an irregular square, the eastern and southern boundaries being unbroken section lines, while the northern line has an offset of two miles, and the western one an offset of three miles, and an irregularity at its northern extremity caused by Mill Creek forming a part of the line. Morgan county is bounded on the north by Hendricks and Marion, on the east by Johnson, on the south by Monroe and Brown, and on the west by Owen and Putnam counties. It was organized in the spring of 1822 by the appointment of Benjamin Hoffman, Jonathan Williams and Larkin Reynolds, County Commissioners, George H. Beeler, Clerk, and Benjamin Cutler, Sheriff. These appointments were made by the Governor, and the commissioners proceeded to divide the county into civil townships and complete the organization by ordering an election for the remaining county and the township officers.

The first permanent settlement of white inhabitants in Morgan county was made in the spring and summer of 1819, on the southeast side of White River, between the mouth of Crooked Creek and the bluff, where the village of Waverly now stands.

Soon after the ratification of the treaty of St. Mary's (in the autumn of 1818), extinguishing the Indian title to all the land lying in the central portion of the State, an idea became prevalent that the four sections of land donated to the State for a capital by the act of Congress admitting it into the Union, would be located near the bluffs of White River. This brought a number of adventurers into the wilderness, even before the land was surveyed. This settlement before the close of the year 1819 had swelled to the number of about a dozen families, which served as a kind of center of distribution for subsequent immigration.

Cyrus Whetzel, who located his cabin near the mouth of Bluff Creek, had opened a trace through the forest from the older settlements on White Water, and for several years afterward "Whetzel's trace" was an institution familiar to all emigrants from the east to Central Indiana. Hiram

T. Craig and James and Robert Stott, who settled at the mouth of Crooked Creek, two miles below Whetzel's, had also opened a trace from Vernon, by the mouth of Flat Rock, now Columbus. This opened a communication with the southern settlements of Indiana, and gave this early pioneer colony a prominence, and, indeed, made it the parent of numerous other backwood settlements.

The county, at present, is divided into fourteen civil townships, arranged in four tiers, north and south, beginning at the north end of the eastern tier, as follows: First, Madison, Harrison, Greene and Jackson; second, Brown, Clay and Washington; third, Monroe, Gregg, Jefferson and Baker; fourth, Adams, Ashland and Ray. These are quite irregular, both in size and form, several of them having White River for one boundary, which gives a very irregular margin.

The principal towns are Martinsville, in Washington township, the county seat; Mooresville, in Brown; Brooklyn and Centerton, in Clay; Waverly, in Harrison; Morgantown, in Jackson; Paragon, in Ray; Alaska, in Ashland; Eminence, in Adams; Hall, in Gregg, and Monrovia, in Monroe.

DRAINAGE AND TOPOGRAPHY.

White River traverses Morgan county diagonally from northeast to southwest, and, with its tributaries, furnishes ample drainage for the whole county, with the exception of Adams and a part of Ashland townships in the northwest corner of the county, which are drained by tributaries of Eel River. On the southeast side, White River receives Bluff Creek, Crooked Creek, Stott's Creek, Clear Creek, Indian Creek, Little Indian Creek and Bryant's Creek. From the opposite side, it receives White Lick, Sycamore Creek, Highland Creek, Lamb's Creek, Burkhardt's Creek, Fall Creek and Butler's Creek. Running westwardly into Eel River, we have Lake Creek, Mud Creek and Rhoades' Creek. These complete a most perfect system of drainage, and, at the same time, supply the country with water from numerous springs which break out along their several courses. White River is a large stream, having been declared a public highway for navigation by act of Congress before the land was surveyed.

In the early years of the settlement of this county, flatboats loaded with produce, were occasionally floated to New Orleans, at the time of spring freshets in White River, and in the spring of 1824 a stern-wheel steamboat made its way up this stream as far as Indianapolis. But since the forests have been cleared away, the streams have greatly diminished in size and persistence of volume, though, if there was a demand for it, White River could still be used for flatboat navigation at the time of spring floods; but railroads having supplied the demand for transportation, the river is no longer used for that purpose. The general course of White

River through Morgan county is more direct than it is above this, and a number of short curves and "horse-shoe bends," which existed when the bottom lands were covered with timber, have been relieved by the water making a new channel or "cut-off" since the forests were cleared away. A cordon of rocks form rapids in the river in section 32, range 1 east, township 12 north, in which the river has a fall of four feet in half a mile.

Several of the tributaries of White River, above named, were, formerly, regarded as valuable mill streams, but at present they are nearly dry during the summer and fall months, and are, therefore, practically worthless for mill purposes.

In its general surface, Morgan county is more diversified than most other counties in the State. A belt of country along the northern border of the county, embracing Madison, Brown, Monroe and Adams townships, is quite level, or, at most, not so broken as to materially interfere with cultivation. It is covered with a deep deposit of drift material, forming a soil more largely mixed with sand than the clay soil of the regions further north. It is, therefore, a friable, mellow soil, easily cultivated and very productive. Adams, and the western half of Monroe township, present large tracts of black-muck swamp lands, that were originally covered with water a great part of the year; but ditching and underdrainage is converting these swamps into the best of farm lands, especially adapted to the production of corn. This region was originally covered with a heavy forest of white oak, burr oak, ash, beech, sugar maple, black walnut, yellow poplar (tulip tree), hickory, etc. But little of this, however, remains. Much of it was displaced to make room for cultivation, and the recent demand for walnut, poplar, ash and oak lumber has thinned out most of the choice timber from the forests that remain.

Directly south of this belt, and embracing the greater part of Clay, Gregg and Jefferson townships, lies a region of knobs, but little of which is level enough for profitable cultivation. The hills, in some places, rise to the altitude of three hundred feet above the level of the river, and are frequently so steep as to make the ascent difficult, even on foot. The surface soil of these knobs is generally clay, with but a very thin coat of vegetable loam covering it. It, however, produces a good growth of grass, and both peach trees and apple trees make a vigorous growth on it, and appear to be long-lived. These knobs, therefore, may be utilized for pasturage and fruit culture. The forest on these hills was originally a rather small growth of white oak, jack oak, black hickory, with an occasional grove of sugar maple. Much of this timber has been sold—the oak for railroad ties and the hickory for wagon timber.

West and southwest of these knobs lie Ashland and Ray townships, the uplands of which consist of an elevated plain of clay lands, interspersed with an occasional spot of very rich loamy soil. In places it is broken by numerous funnel-shaped depressions, familiarly known as sink-holes.

Some of these are thirty feet deep and embrace half an acre of surface. The hills bordering the streams are in many places abrupt bluffs of limestone. The timber here very nearly answers to that on the northern tier of townships, with the absence of the burr oak. Some of this land will be improved by underdraining, when it will produce well.

The uplands in the townships of Harrison, Greene, Jackson, Washington and Baker, lying on the southeast side of White River, are more uniform in their character than those on the opposite side of the river. In the vicinity of White River, the surface in many places is quite hilly and the general elevation of the country is about two hundred feet above the level of the river. But these hills are seldom so steep as to materially interfere with cultivation. The soil on them is generally a sandy loam.

After passing back from the river hills two or three miles, the surface becomes gently undulating, and in many places quite level, while the soil changes from a sandy loam to a compact clay loam, resting on a rather hard clay subsoil. These lands will require tile drainage to develop their full producing capacity. Under proper treatment, there are but few soils that will be more productive or more pleasant to cultivate than the land on the eastern border of Morgan county.

White River, in its course, develops a very wide margin of bottom land, about two-thirds of which lies above the reach of freshets, and that which is subject to overflow is seldom visited by this catastrophe except in the spring months, and the crop on these lands being generally Indian corn, can be planted after the freshet has subsided, and a heavy yield secured, for these lands are inexhaustively productive. While the bottom lands are distributed pretty uniformly along the river (for the hills are seldom less than a mile apart), yet the large districts of bottom lands may be considered in three groups, to-wit:

The Centerton, or White Lick, bottom, is about five miles long, and in several places, more than two miles wide. Lamb's bottom extends from the rapids of White River, nearly opposite to Martinsville, to a point some distance below Paragon, giving an area of about twenty-five square miles, most of which is above high water. Indian Creek bottom, on the southeast side of the river, extends from Martinsville to the west line of Washington township, a distance of about six miles, with a width of from one to three miles. In this bottom, in section 17, range 1 east, township 11 north, there occurs the curious phenomenon of a "lost hill," as it is familiarly called. This consists of a hill about one hundred feet high, nearly a mile long and a quarter of a mile wide, detached from the main upland by a strip of bottom land half a mile wide, more or less. The hill consists chiefly of a mass of heavily stratified sandstone. Indian creek bottom is much of it subject to overflow—more, however, from the freshets of Indian Creek than from the floods of White River. Like all other alluvial lands, these bottoms are generally built on a substratum of gravel,

which gives perfect underdrainage to these broad, level plains, that renders them exceeding productive. I observed a spot in the Centerton bottom, and one or more in Lamb's bottom, that were exceptions to this rule. These are composed of a sedimentary deposit of a very fine, light-colored clay. The bricks used in the construction of the new State Capitol are made from this Centerton deposit and it proves to be an excellent material for the purpose. The manner in which these large districts of bottom land were formed, and the nature of the forces operating in their formation, will be considered in their proper place; at present we speak of them only in their economical relation, as furnishing an area of more than fifty square miles, in this county, of land which has no superior in points of productiveness, durability and adaptation to a variety of crops.

GEOLOGY.

The underlying rock of nearly the whole of Morgan county is the knob sandstone, which is now generally regarded as the lowest member of the Carboniferous formation. Measuring its outcrop from its junction with the Devonian shale on Bluff Creek, in Johnson county, along the line of strike to the point of its disappearance under the Keokuk limestone, near the corner of Owen county, and allowing it a dip of twenty feet to the mile, we may assume the thickness of the knob sandstone at this point to be about five hundred feet. This corresponds very nearly to the register of the boring at Reelsville, in Putnam county, where a thickness of four hundred and eighty-eight feet was reported. The base of this formation consists of a clay shale, thinly laminated but not distinctly stratified. This shale, when moist, has a pale blue color, but when dry it is ash colored. When exposed to the weather, it crumbles into a mass of sandy clay, with scarcely enough iron in its composition to tinge it red when burned. This shale has occasional bands of a hard, blue rock, from three to ten inches thick, interposed at irregular distances. These rocks are siliceous, though they have not the mechanical structure of sandstones. They are generally smooth and parallel on their faces, but, lacking elasticity, they endure change of temperature badly. Their hardness and firm appearance have often misled builders to use them in preference to the softer but more durable sandstones. The entire absence of fossil remains is a rather remarkable feature of this shale, for though it had, probably, neither lime nor silica in a proper state to produce petrifications, yet it appears to have been an excellent material to receive impressions and retain them in the form of moulds or casts; but a diligent search revealed no such marks of organic remains. A few crinoid stems and an indistinct impress of a coral, found near Waverly, was the only evidence of life which I observed in this extensive deposit of shale. This is the more remarkable as it is in a shale corresponding to this, and nearly on the same

horizon, that the noted crinoid beds of Crawfordsville are found. At a point, however, five miles below this, on the southeast side of the river, near the mouth of Clear Creek, a bed of argillaceous sandstone occurs, which abounds in fossils, though the species are not numerous. We obtained *Taonurus Colleti*, *Zaphrentis Dalei*, *Spirifer Carteri*, *Productus semi-reticulatus*, *Productus costatus*, and fragments of several unidentified species were also observed.

The upper members of this formation present a distinctly stratified sandstone, generally of a gray, or light drab color, sometimes showing a distinct shade of buff. The lower members of this series are often so largely mixed with clay as to destroy their value as a building material. This clay gives a more or less distinct blue shade to the stone; and though it is generally harder than the purer sandstone, yet, on exposure to the weather it disintegrates rapidly. In selecting building stone from this formation *it will be safe to reject all that have the blue or lead colored shade*. Higher in the series, and generally crowning the highest elevations, we find a fine-grained sandstone, in strata ranging from one foot to five feet thick. This stone is quite soft in the quarry, and this feature of its character has deterred architects from adopting it as a building stone. But when it loses its quarry moisture, and is once thoroughly seasoned, it becomes very firm and hard, and absorbs but little water when exposed.

The chief defect I observed in this rock, as a building material, is the occasional occurrence of small specks of oxide of iron that may produce unsightly stains; but these are small, and, in the thicker strata, of rare occurrence. Care must be observed in quarrying this rock. Like most sandstones, the grains cohere with but little force in the quarry condition, and even a very moderate blast will shatter the firmest rock in these quarries for a distance of fifteen feet or more, so as to render it practically worthless. Blocks may be taken out very rapidly and neatly with a channeling machine, or with steel wedges, even without drilling.

The outcrop of this rock occupies the summit of the hills on the southeast river front, from the mouth of Bluff Creek to Martinsville with but two or three interruptions, the widest of which is at the mouth of Stott's Creek. But few quarries, however, have been opened, and these have not been worked to any considerable extent, and generally with but little skill or science.

Mr. S. J. Mandeville has opened a quarry at Peach Orchard Hill in section 6, range 2 east, township 11 north, and is taking out a good quality of stone, and exhibiting both science and skill in the operation. The strata in this quarry now exposed range from two feet to five and a half feet thick, and the stone is very uniform in its texture. It shows but few iron specks and no petroleum stains that disfigure many of the Ohio and Pennsylvania sandstones.

This is the only point in the county where the working of the quarry gave me a fair opportunity to judge the quality of this stone as a building material, and, after examining it, both in the quarry and in its dressed and seasoned condition, I have no hesitancy in saying that it will fairly compete with the best Ohio sandstone, both in point of beauty and durability. Mr. Mandeville's quarry is eight hundred and sixty-two feet above tide water and two hundred and sixty-five above Martinsville.

It is not improbable that stone of a quality equally as good as this at the Peach Orchard quarry may be found at other points in the county, and more convenient to railroad transportation than this is; but the quarries are not opened, or have been so imperfectly worked that it is difficult to form such a judgment of the stone as if it were exhibited under more favorable circumstances.

One mile east of Mooresville a quarry has been worked by an Indianapolis company for the last five years, and a large amount of stone, of a fair quality, has been taken out. This quarry is too low in the formation to yield the best quality of stone. The strata do not exceed eighteen inches thick, and in some of the strata there is too much clay in the composition to be entirely reliable in exposed situations. This quarry is the nearest workable outcrop of rock to Indianapolis; and with a railroad switch to the quarry, and proper care in selecting the rock, this quarry may be very profitably worked. A mile west of Waverly an outcrop of sandstone appears in several places, which gives promise of valuable quarries, but they have not been worked sufficiently to determine fully the character of the rock. The strata, where exposed, are from twelve to twenty inches thick, and generally of a drab or light buff color, and of a very fine grain.

From the exposure of this rock at "The Bluffs" (now Waverly), the material was obtained for the foundation of the former court house, the abutments of the National road bridge over White River at Indianapolis, and the basement of the old state house. In the last, the blue stone was unfortunately selected, and its speedy decay brought the stone into bad repute. The bridge abutments and the court house foundations proved reasonably durable.

Nearly all the higher knobs of Clay, Gregg and Jefferson townships are capped with sandstone, though it does not always appear on the surface, and in many places, no doubt, quarries may be opened and worked with profit. This remark, however, can apply only to localities favored with railroad transportation.

The summit of the high hill (known by the local name of Mount *Ætna*) about a mile southwest from Brooklyn is worth a careful examination. It is proper to say, in this connection, that the exposed rocks on the northwest side of the river, lying nearer the summit of the formation, are more highly charged with iron oxide than those nearer its middle.

SUB-CARBONIFEROUS LIMESTONE.

At the mouth of Rhoades Creek, near the northwest corner of Ashland township, the Keokuk member of the sub-carboniferous limestone makes its appearance on the eastern bank of the Mill Fork of Eel River. At this point it is thinly stratified and rather argillaceous in its composition, but near Alaska, three or four miles southeast, it is well developed and presents its characteristic fossils. These are quite numerous in the individuals, but embrace only a few species. (See Appendix.)

Three miles south of this, at Porter's Cave, immediately on the Owen county line, the St. Louis member crowns the hill above the cave, while the gorge below is excavated in the Keokuk. Immediately at the junction of these members of the sub-carboniferous limestone, there occurs a single stratum of dolomite, five feet thick. It is quite soft, and has the peculiar unctuous feel, characteristic of magnesian rocks.

PORTER'S CAVE

Is formed by a considerable stream of water, which has cut away the soft magnesian rock, and has worn its way some two feet into the Keokuk strata which forms the floor.

The opening of the cave looks to the southeast, and is twenty-five feet wide, with an average height of seven feet. The roof, for the first one hundred feet, is smooth, and appears to be composed of a single slab of St. Louis limestone. In this distance, the cave narrows to an average width of sixteen feet, with an elevation of five feet six inches. From this point the roof breaks and is irregular, reaching in some places an elevation of from twenty-five to thirty feet. At the same point the walls abruptly recede, and display a room thirty feet wide, with irregular walls, incrustated with adhering stalactites. For the next reach of one hundred yards, the width gradually narrows to ten feet and the roof becomes a gothic arch by the jutting forward of the strata, which are now, in most places, covered by the stalactite formation. The floor is tolerably smooth, and quite free from loose stones. A brisk current of water, from four to ten feet wide and two or three inches deep, runs on the floor, varying its position from side to side, making the frequent crossing of it a necessity. I extended my observation for about four hundred yards, when the water (covering the bottom from side to side) became so deep as to demand waterproof boots, which I had not with me. As far as I explored, the roof continued so high as to permit of walking upright, though I am informed that, further on, it is, in some places, so low as to require the explorer to stoop. The cave has an opening on the opposite side of an elevated ridge, three-quarters of a mile from the outlet I examined. At the first room, one hundred feet from the entrance, there is exposed several

strata of limestone, ranging from one to four feet thick, which show a decidedly oolitic structure. The stone is much harder than the Bedford or Ellettsville stone, but this may be owing to its having been long exposed. Immediately below the cave, the water coming from it forms a cascade by making a leap of thirty feet from the floor of the cave into a wild and romantic glen.

Porter's Cave is directly on the line between Morgan and Owen counties, five miles northwest from Paragon.

The region of country along Butler's Creek, below the cave, including the ridge between that stream and Fall Creek, on the east, gives a remarkable instance of the influence of the geology of a country on its topography and soil. Passing westward over the knobs of Sycamore Creek, Lamb's Creek, Burnett's Creek, and Fall Creek, we observe the sterile soil, with its stunted growth of white oak and black hickory, but, suddenly, on reaching a hill capped with St. Louis limestone, immediately we enter a forest of sugar maple, black walnut, yellow poplar, blue ash, wild cherry, etc. But these rich hills are badly broken by sink-holes.

GLACIAL PHENOMENA.

The drift deposits of Morgan county, like its topography, is varied and very irregular. On the southeast side of the river, the surface deposit is more uniform than on the opposite side. In a few instances, we find the usual deposit of clay, gravel, and bowlders replaced by a heavy deposit of sand, evidently derived from the denudation and destruction of the knob sandstone of the immediate vicinity. This is not distributed uniformly over the surface, making a level plain, as is common with drift deposits, but it gives a surface broken into rounded hills, from fifty to one hundred feet high, suggesting their deposit, by eddies, on the margin of great currents of water. A good opportunity to study these sand hills occurs a little way east of Martinsville, along the northern margin of the Indian Creek bottom. At a large spring, about three-fourths of a mile northeast of Martinsville, I observed the base of the sand deposit resting on the blue clay which generally constitutes the lowest member of the foreign drift. Beyond this, as we recede from the river hills, the drift resumes its usual appearance of clay plains, with occasional bowlders of granite or gneiss distributed over the surface; though these are neither so frequent in occurrence, nor so large, as they are further north.

On the northwestern side of White River, in the northern tier of townships, the drift is deep and continuous, with its base of blue clay, and its upper member of yellow clay, with water-worn pebbles interspersed and an occasional bowlder of granite on the surface. Some of these are very large. On section 4, range 2, township 12, I measured a bowlder of flesh colored granite, with these dimensions: length, 15 feet 4 inches; greatest

breadth, 13 feet; height above ground, 11 feet 9 inches. It is an irregular oblong, with the corners well rounded off. It shows no indications of decay. South of an irregular line from Brooklyn to Eminence, the boulders almost entirely disappear, and, with them, the upper drift also, leaving an irregular deposit of blue clay, constantly broken by the deep ravines which lay bare the underlying strata and cut the country into knobs.

The glacial period has left its footprints on the surface of Morgan county in a manner that time will hardly efface. Beginning at the Mill Fork of Eel River, a little north of Eminence, there is a valley about five miles wide, extending in a northeasterly direction; crossing the valley of White Lick Creek a short distance north of Mooresville, it passes into Marion county between West Newton and Friendswood, and, thence to the valley of White River. From its western origin, to a point in section 1, range 1, township 13, near Monrovia, the valley gradually narrows to a width of about one mile. Originally, this section of the valley was a continuous lagoon, or swamp, locally known as "The Lake"; but now it is drained westwardly into Eel River, by a public ditch, which has become quite a large creek. On the northern side, the depression of this valley seldom exceeds forty feet below the general level of the country, and the descent is commonly quite gradual. On the opposite side, the country rises from fifty to one hundred feet, and sometimes pretty abruptly. From the water-shed near Monrovia, the drainage is eastward, by McCracken's Creek, to White Lick. In this section, the descent gives a rapid current to the water, though the valley maintains a width of a mile or more, with well defined margins, the south side still maintaining the greater elevation. East of White Lick, the outline of the valley is less distinctly marked, yet, on close observation, its course is plainly visible. The topography west of White Lick indicates that this valley was the southern margin of the ice-field for a long time, and received the drainage floods from the disappearing glacier. South of this, I observed no gravel beds, or other evidence of rapid currents that mark a dissolving glacier.

The valley of Indian Creek gives evidence of having been the bed of a glacial river, bearing the same relation to the knobs in Washington township and Brown county that the one above described does to the knobs of Gregg and Clay townships. Several smaller valleys of erosion, that properly may be referred to this period, were observed, but they are not of sufficient importance to require special notice.

The broad valley of White River, in this county, however, is a geological phenomenon that demands careful study. It is evidently a valley of erosion, for the strata in the hills bordering the valley on either side have their natural dip undisturbed, and the several members correspond correctly on opposite sides of the valley. This lies from 250 to 300 feet below the general level of the drift plain forming the adjacent uplands;

and of this depth, at least 200 feet is cut through the rock strata of the Knob sandstone. The area denuded to this depth in the county is not less than 150 square miles. This amount of erosion since the Carboniferous period, by a stream no larger than White River, would be almost incredible; but there is conclusive evidence that, at the close of the Drift epoch, a volume of water passed down the valley of White River vastly larger than that which now flows there, or than that which filled its channel when Congress declared it navigable.

But there is another circumstance which must be taken into the account when estimating this erosion. From fifty to one hundred feet of the lower portion of this rock is a soft clay shale, easily cut away, and, being very fine material, would be transported by even a very gentle current. A torrent of water would rapidly undermine the overlying sandstone, and, falling into the surging current in its soft state, it would be readily ground to sand and carried away. The sand hills in the vicinity of Martinsville give evidence of the burden of sand which that flood carried.

METALS AND ORES.

The base of the Carboniferous formation is frequently rich in iron ores, but in Morgan county it is peculiarly barren in this respect. A few nodules of iron ore were observed in two or three localities, associated with the clay shale so common here, but in no place is it found in such quantities as would promise valuable deposits of ore. Detached fragments of both lead and zinc ores (sulphide) have been picked up in several places in the knob districts; and, at least, in two localities, I observed specimens of galena, in quartz nodules imbedded in sandstone, but in no place could I find a well defined vein, or lead, of sufficient promise to encourage further search for these metals.

In the year 1850, some returned California gold miners observed the characteristic black sand in the ravines, among the knobs of Brown and Morgan counties, and immediately commenced "prospecting." They found gold in most of the ravines of Bean Blossom Creek, in Brown county, and in the tributaries of Sycamore Creek and Lamb's Creek, in Morgan county. Some of the more skillful miners were able to wash out two or three dollars' worth of gold per day for several weeks. But the excitement of an actual "placer mine" in Indiana brought together so many fortune hunters, that every ravine was directly occupied and the sands were soon washed out, and the "gold fever" subsided. Within the last few years the excitement has been revived, and gold-washing, to a limited extent, has been resumed, paying from fifty cents to a dollar per day. The gold is in very thin scales or in almost invisible grains, and is remarkably free from alloy of any kind.

The origin of this gold is a geological problem of some importance, as

the underlying rock is of comparatively recent date and shows no indications of trap dykes, quartz veins, or other geological disturbances. The only rational solution of the problem appears to be that which refers the gold to the blue clay, which is the lowest member of the drift. Where the clay forms the summits or sides of the hills, it is washed into gulches by the rains. The lighter and finer particles are borne onward with the current, while the heavy black sand and gold lodge among the rocks in the bottom. But as the lower blue clay is the ascertained matrix of the gold, still the question, How came gold to be mixed with this particular clay, in this special locality? remains to be answered. Two methods of solving this problem have been proposed. The first assumes that the gold-bearing clay of Brown, Morgan and Montgomery counties, in Indiana, certain localities near the Vermillion salines, in Illinois, and a few local spots on the Des Moines, in Iowa, indicate a line of early drift, from regions of gold-bearing quartz, which, being crushed and broken down in its passage, liberated the gold in the form we now find it. The other hypothesis assumes that the lower blue clay contains minute quantities of gold everywhere, and that it accumulates, in appreciable quantities, only in the sands of ravines where the country is hilly and extensive surfaces are washed into streams that are sufficiently rapid to carry away the lighter material and leave only the gold and heavy sand to accumulate, it may be for centuries, till we can detect the presence of the precious metal. But either of these solutions will involve that more difficult question, From whence came the material that now covers thousands of square miles with a talcose clay to a depth varying from ten to five hundred feet? The discussion of this question would be out of place here; and here for the present I leave it, adding, however, the practical caution, that fortunes will never be made by gold-mining in Morgan county.

OTHER MINERALS.

There is a pretty well authenticated tradition that the Indians made salt from water of a spring, or shallow well, on the border of the lake valley, about two miles north of the village of Eminence. I examined the locality with some care, and though I found a large bog spring of common chalybeate water near the location of the traditional saline, yet I found no traces of any excavation, nor of even brackish water. The occurrence of brine, in this locality, however, is not an improbability. In boring through the Knob sandstone at Reelsville and at Terre Haute, brine of fair strength was found; and as the whole depth of that formation lies below this locality, any deep fissure in the rock would be likely to reveal brine. But salt is now so cheap, that its manufacture could hardly be made profitable here.

On the southern border of the town of Monrovia, is a deposit of mag-

nesian clay of a very fine quality. It is quite free from iron, and when burned has a light cream color, similar to Milwaukee brick. It is at present used in the manufacture of drain tile.

Two diamonds have been found in the drift of the Indian Creek valley. One is now in possession of Mr. Harry Craft, a well-known jeweler of Indianapolis. It is cut and set. It had a weight of three carats in its rough state. It was found near Morgantown. The other is somewhat larger, and is uncut. It is in the possession of Mr. Maxwell, who resides three miles south of Martinsville. It was found on his farm. Both of these stones appear to have had an original connection with the drift of Indian Creek valley.

ARCHÆOLOGY.

The Mound Builders have left no remarkable monuments of their occupancy of the territory now included in Morgan county, yet it is quite certain that the large districts of bottom land did not fail to attract the attention of these primitive cultivators of the soil. That a dense settlement—probably a large town—of this race once existed near the mouth of White Lick, is an inference from the numerous small burial mounds in and near the town of Centerton, and from the stone implements, such as axes, chisels, knives, arrows and spear-heads, etc., that are frequently found in this vicinity. But few specimens of pottery have been detected in this county. A large vase, however, was recently found in a gravel pit near Waverly, by a company of workmen who were constructing a road. It was associated with a male skeleton, buried in the sitting posture. It was finely proportioned, richly ornamented, and had a capacity of two or three gallons. Unfortunately the workmen broke it into fragments so small that it was impossible to reconstruct it. I saw a collection of these fragments, which indicated that the original had been a fine work of art. This discovery proves that the Mound Builders did not always bury, even their distinguished dead, in mounds.

About a mile northeast from the town of Paragon, on the point of a high hill which projects into the bottom land, is a lookout mound, commanding a wide view to the southwest. A beacon fire on this mound could be distinctly seen on the range of hills west of Gosport, ten or twelve miles distant. On a similar hill, two miles due north from Paragon is another lookout mound, commanding an extensive prospect to the southeast. Near Brooklyn, on the east side of the Indianapolis & Vincennes Railroad, is a large mound, constructed on the south end of a gravel ridge one hundred yards long. The mound has a base of about one hundred feet in diameter, and rises twenty feet above the ridge on which it stands. It is constructed entirely of gravel, which suggests a doubt of its artificial character. But its regularity, and the depression in the ridge, indicating the place from whence the material was taken

that was used in its construction, confirms the opinion that it is the work of human hands, though it may be more recent than the age of the primitive Mound Builders. Passing over a newly-plowed corn field, about a mile west of this, I picked up a stone axe which weighs seven pounds. It is made of a fine-grained gray stone—perhaps a fine granite.

Morgan county was a favorite hunting ground of the Delaware Indians, a principal town of which tribe was located on the west bank of White River, a few miles above Waverly. Game was abundant in the dense forests that covered the broad river bottoms, and the hills furnished winter food in the acorns, beech nuts and other native seeds. Deer, bears and turkeys were abundant, and White River was well supplied with an excellent quality of fish. These, together, furnished the Indian an easy living, which he left with many regrets.

RAILROADS.

The Indianapolis & Vincennes Railroad traverses the county from northeast to southwest. Its road bed and bridges are permanently constructed, and its trains are run with regularity, safety and comfort.

The Martinsville, Franklin & Fairland Railroad is an auxiliary to the Cincinnati, Indianapolis, St. Louis & Chicago Railroad. It furnishes a direct line to Cincinnati, and makes connection at Franklin with the Louisville line. It is in contemplation to extend this road westward, up the valley of Lamb's Creek, to the coal fields of Owen and Clay counties.

The line of a coal road from Indianapolis to the Eel River coal fields has been located through the great glacial valley in the northern part of the county, but adverse circumstances have hitherto interfered to prevent its construction. However, this is but a question of time, for Indianapolis must, before long, have a direct supply of coal, and this line will reach good coal in the shortest distance, on a line of easy construction and low grades. It will, moreover, open a region of agricultural capabilities second to none in the State, and forests of hard wood, which will be invaluable to the manufactories of Indianapolis.

LIST OF FOSSILS IN MORGAN COUNTY.

I collected the following fossils in the strata of Morgan county :

<i>Taonurus Colletti</i>	Knob sandstone.
<i>Zaphrentis Dalei</i>	Knob sandstone.
<i>Spirifer Carteri</i>	Knob sandstone.
<i>Productus semi-reticulatus</i>	Knob sandstone.
<i>Productus costatus</i>	Knob sandstone.
<i>Plurotomaria</i> (Sp.?)	Knob sandstone.
<i>Spirifer Keokuk</i>	Keokuk limestone.
<i>Spirifer Grimesi</i>	Keokuk limestone.
<i>Productus punctatus</i>	Keokuk limestone.
<i>Productus Cora</i>	Keokuk limestone.
<i>Palæacis cuneatus</i>	St. Louis limestone.
<i>Rotalia Baileyi</i>	St. Louis limestone.
<i>Aulopora gigas</i>	St. Louis limestone.
<i>Zaphrentis spinulifera</i>	St. Louis limestone.
<i>Cyathocrinus</i> (Sp.?).	St. Louis limestone.
<i>Fenestella Shumardi</i>	St. Louis limestone.
<i>Archimedes Wortheni</i>	St. Louis limestone.
<i>Orthis dubia</i>	St. Louis limestone.
<i>Athyris subquadrata</i>	St. Louis limestone.
<i>Athyris hirsuta</i>	St. Louis limestone.
<i>Terebratula formosa</i>	St. Louis limestone.
<i>Euomphalus Spergenensis</i>	St. Louis limestone.
<i>Dentalium venustum</i>	St. Louis limestone.

CONNECTED SECTION.

Alluvial (bottoms)	10 to 20 ft.
Second bottom	15 to 30
Lacustral—Loess	5 to 15
Glacial drift, about	100
St. Louis limestone	30
Keokuk limestone	50
Knob sandstone	500
Devonian shale	00
Total	745 ft.